4B CHEMICALS AND ALLIED PRODUCTS (SIC 28)

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified fifteen 4-digit SIC codes in the Chemical and Allied Products Industry (SIC 28) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws equal to or greater than two million gallons per day (MGD) from a water of the United States, and uses at least 25 percent of its intake flow for cooling purposes (facilities with these characteristics are hereafter referred to as "section 316(b) facilities"). For each of the fifteen SIC codes, Table 4B-1 below provides a description of the industry sector, a list of primary products manufactured, the total number of detailed questionnaire respondents (weighted ro represent national results), and the number and percent of section 316(b) facilities.

Table 4B-1: Section 316(b) Facilities in the Chemicals and Allied Products Industry (SIC 28)

SIC	SIC Description	Important Products Manufactured	Number of Weighted Detailed Questionnaire Survey Respondents		
			Total	Section 316(b) Facilities	
				No.[a]	%
Inorganic Chemicals (SIC 281)[b]					
2812	Alkalies and Chlorine	Alkalies, caustic soda, chlorine, and soda ash	28	20	68.7%
2813	Industrial Gases	Industrial gases (including organic) for sale in compressed, liquid, and solid forms	110	4	3.9%
2816	Inorganic Pigments	Black pigments, except carbon black, white pigments, and color pigments	26	4	16.7%
2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	Miscellaneous other industrial inorganic chemicals	271	33	12.2%
Total Inorganic Chemicals			***435***	***61***	***14.1%***
Plastics Material and Resins (SIC 282)					
2821	Plastics Material and Synthetic Resins, and Nonvulcanizable Elastomers	Cellulose plastics materials; phenolic and other tar acid resins; urea and melamine resins; vinyl resins; styrene resins; alkyd resins; acrylic resins; polyethylene resins; polypropylene resins; rosin modified resins; coumarone-indene and petroleum polymer resins; miscellaneous resins	***305***	***15***	***4.8%***
Organic Chemicals (SIC 286)[c]					
2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	Aromatic chemicals, such as benzene, toluene, mixed xylenes naphthalene, synthetic organic dyes, and synthetic organic pigments	59	4	7.3%
2869	Industrial Organic Chemicals, Not Elsewhere Classified	Aliphatic and other acyclic organic chemicals; solvents; polyhydric alcohols; synthetic perfume and flavoring materials; rubber processing chemicals; plasticizers; synthetic tanning agents; chemical warfare gases; and esters, amines, etc.	364	48	13.1%
Total Organic Chemicals			***423***	***52***	***12.3%***

Table 4B-1: Section 316(b) Facilities in the Chemicals and Allied Products Industry (SIC 28)

SIC	SIC Description	Important Products Manufactured	Number of Weighted Detailed Questionnaire Survey Respondents		
			Total	Section 316(b) Facilities	
				No.[a]	%
Other Chemical Sectors					
2823	Cellulosic Manmade Fibers	Cellulose acetate and regenerated cellulose such as rayon by the viscose or cuprammonium process	7	1	14.9%
2824	Manmade Organic Fibers, Except Cellulosic	Regenerated proteins, and polymers or copolymers of such components as vinyl chloride, vinylidene chloride, linear esters, vinyl alcohols, acrylonitrile, ethylenes, amides, and related polymeric materials	36	9	24.1%
2833	Medicinal Chemicals and Botanical Products	Agar-agar and similar products of natural origin, endocrine products, manufacturing or isolating basic vitamins, and isolating active medicinal principals such as alkaloids from botanical drugs and herbs	33	3	9.9%
2834	Pharmaceutical Preparations	Intended for final consumption, such as ampoules, tablets, capsules, vials, ointments, medicinal powders, solutions, and suspensions	91	4	4.7%
2841	Soaps and Other Detergents, Except Speciality Cleaners	Soap, synthetic organic detergents, inorganic alkaline detergents	36	4	12.0%
2873	Nitrogenous Fertilizers	Ammonia fertilizer compounds and anhydrous ammonia, nitric acid, ammonium nitrate, ammonium sulfate and nitrogen solutions, urea, and natural organic fertilizers (except compost) and mixtures	60	9	14.4%
2874	Phosphatic Fertilizers	Phosphoric acid; normal, enriched, and concentrated superphosphates; ammonium phosphates; nitro-phosphates; and calcium meta-phosphates	41	1	2.9%
2899	Chemicals and Chemical Preparations, Not Elsewhere Classified	Fatty acids; essential oils; gelatin (except vegetable); sizes; bluing; laundry sours; writing and stamp pad ink; industrial compounds; metal, oil, and water treating compounds; waterproofing compounds; and chemical supplies for foundries	162	4	2.7%
Total Other			***466***	***36***	***7.6%***
Total Chemicals and Allied Products (SIC 28)					
Total SIC Code 28			**1,629**	**163**	**10.0%**

[a] Individual numbers may not add up due to independent rounding.
[b] SIC code 281 is officially titled "Industrial Inorganic Chemicals." However, to avoid confusion with SIC code 2819, "Industrial Inorganic Chemicals, Not Elsewhere Classified," this profile will refer to SIC code 281 as the "Inorganic Chemicals sector."
[C] SIC code 286 is officially titled "Industrial Organic Chemicals." However, to avoid confusion with SIC code 2869, "Industrial Organic Chemicals, Not Elsewhere Classified," this profile will refer to SIC code 286 as the "Organic Chemicals sector."

Source: U.S. EPA, 2000; Executive Office of the President, 1987.

The responses to the Detailed Questionnaire indicate that three main chemical sectors account for 78 percent of the chemicals industry section 316(b) facilities: (1) Inorganic Chemicals (including SIC codes 2812, 2813, 2816, and 2819); (2) Plastics Material and Resins (SIC code 2821); and (3) Organic Chemicals (including SIC codes 2865 and 2869). Of the 163 section 316(b) facilities in the Chemical industry, 61 facilities, or 37 percent, belong to the Inorganic Chemicals sector, 52, or 32 percent, belong to the Organic Chemicals sector, and 15, or 9 percent, belong to the Plastics and Resins sector. This profile therefore provides detailed information for these three industry groups.

4B.1 Domestic Production

The U.S. Chemical and Allied products industry includes a large number of companies that, in total, produce more than 70,000 different chemical products. These products range from commodity materials used in other industries to finished consumer products such as soaps and detergents. The industry accounts for nearly 12 percent of U.S. manufacturing value added, and produces approximately two percent of total national gross domestic product (McGraw-Hill, 2000).

Raw materials containing hydrocarbons such as oil, natural gas, and coal are primary feedstocks for the production of organic chemicals. Inorganic chemicals are chemicals that do not contain carbon but are produced from other gases and minerals (McGraw-Hill, 2000).

The Chemicals and Allied products industry is highly energy intensive, consuming about 7 percent of total annual U.S. energy output (McGraw-Hill, 2000). It is one of the largest industrial users of electric energy and also consumes large amounts of oil and natural gas. In total, the industry accounts for approximately seven percent of total U.S. energy consumption, including 11 percent of all natural gas use. Just over 50 percent of the industry's energy consumption is used as feedstock in the production of chemical products. The remaining energy consumption is for fuel and power for production processes. Oil accounts for approximately 42 percent of total energy consumption by the industry. For some products, e.g., petrochemicals, energy costs account for up to 85 percent of total production costs. Overall, total energy costs represent seven percent of the value of chemical industry shipments (S&P, 2001).

a. Output

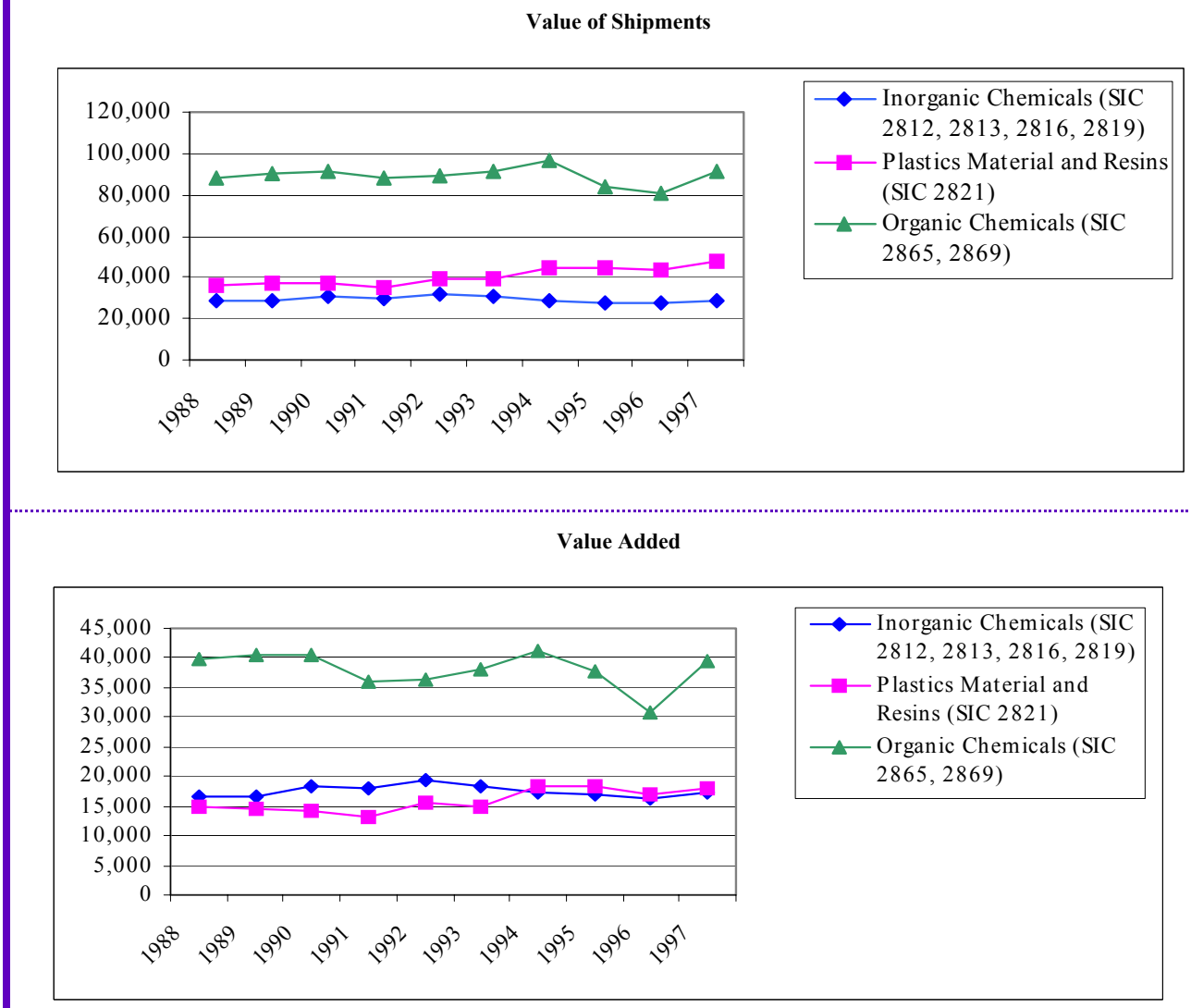
Figure 4B-1 shows the trend in ***value of shipments*** and ***value added*** for the three profiled sectors between 1988 and 1997.[1] Value of shipments and value added are two of the most common measures of manufacturing output. They provide insight into the overall economic health and outlook for an industry. Value of shipments is the sum of the receipts a manufacturer earns from the sale of its outputs. It is an indicator of the overall size of a market or the size of a firm in relation to its market or competitors. Value added is used to measure the value of production activity in a particular industry. It is the difference between the value of shipments and the value of inputs used to make the products sold.

The Organic Chemicals sector (SIC 286) experienced a significant decrease in both value of shipments and value added between 1994 and 1996, before rebounding in 1997. The decrease was a function of increased competition in the global market for petrochemicals which comprise the majority of organic chemical products. The increased competition stems from the considerable capacity expansions for these products seen in developing nations in recent years (McGraw-Hill, 2000).

The Plastics Material and Resin (SIC 2821) and Inorganic Chemicals (SIC 281) sectors have remained relatively stable over the period between 1988 and 1997. The stability in these industry sectors reflects various trends in the markets for their products which are heavily influenced by the overall health and stability of the U.S. economy. In the early 1990s, domestic producers benefitted from the relatively weak dollar which made U.S. products more competitive in the global market. In more recent years, the strength of the U.S. economy has bolstered domestic end-use markets, offsetting the reductions in exports that have resulted from increased global competition and a strengthened dollar (McGraw-Hill, 2000).

[1] Terms highlighted in bold and italic font are further explained in the glossary.

Figure 4B-1: Value of Shipments and Value Added for Profiled Chemical Sectors (in millions, constant $2000)



Source: U.S. DOC, 1988-1991 and 1993-1996; U.S. DOC, 1987, 1992, and 1997.

Table 4B-2 provides the Federal Reserve System's index of industrial production for the three profiled sectors, which shows trends in production since 1997. This index reflects total output in physical terms, whereas value of shipments and value added reflects the value of production. Table 4B-2 shows varying trends in the three sectors since 1997, but sharp declines in production in all three sectors in the first half of 2001. These declines have been caused by the dramatic slowdown in the U.S. economy, which has affected demand in major chemical-using sectors such as steel, apparel, textiles, forest products, and the technology sectors (Chemical Marketing Reporter, 2001).

Table 4B-2: Chemicals Industry Industrial Production Indexes

Year	Basic Inorganic Chemicals[a]		Plastics Materials		Industrial Organic Chemicals	
	Index 1992=100	Percent Change	Index 1992=100	Percent Change	Index 1992=100	Percent Change
1989	92.6	n/a	94.6	n/a	103.5	n/a
1990	101.2	9.3%	95.3	0.7%	104.9	1.4%
1991	97.7	-3.5%	90.4	-5.1%	99.9	-4.8%
1992	100.0	2.4%	100.0	10.6%	100.0	0.1%
1993	95.3	-4.7%	98.0	-2.0%	98.7	-1.3%
1994	88.8	-6.8%	111.9	14.2%	104.9	6.3%
1995	91.0	2.5%	113.0	1.0%	105.6	0.7%
1996	92.6	1.8%	109.2	-3.4%	106.3	0.7%
1997	98.1	5.9%	120.2	10.1%	114.3	7.5%
1998	95.2	-3.0%	131.0	9.0%	108.8	-4.8%
1999	98.9	3.9%	139.5	6.5%	114.6	5.3%
2000	102.7	3.8%	137.7	-1.3%	114.9	0.3%
Total Percent Change 1989-1997	*11%*		*46%*		*11%*	
Average Annual Growth Rate	*0.9%*		*3.5%*		*1.0%*	
Jan.-June 2000[b]	101.9	n/a	142.6	n/a	117.5	n/a
Jan.-June 2001[b]	95.5	-35.6%	132.9	-7%	98.1	-17%

[a] Includes alkalies and chlorine, inorganic pigments and inorganic chemicals.
[b] Average over the six month period.

Source: Federal Reserve Board, 2001.

b. Prices

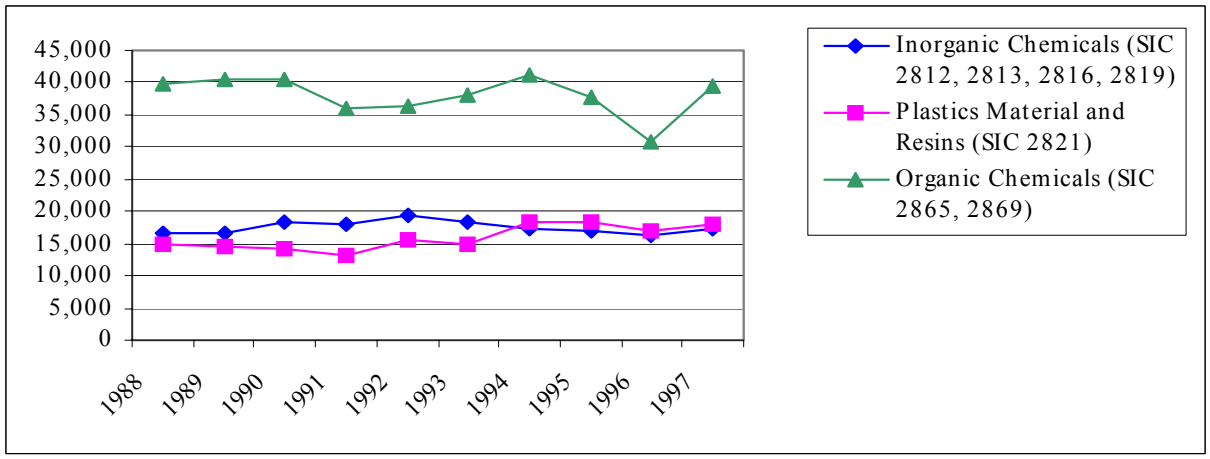
Selling prices for the products of the Organic and Inorganic Chemical sectors have increased from 1987 to 1989 and remained stable through 1994. Between 1994 and 1995, prices increased sharply, followed by a period of stable prices through 1997. Prices for plastics material and resins followed a trend similar to the other two chemical industry sectors but with larger fluctuations (see Figure 4B-2).

The fluctuations in chemical and plastics prices are in part a function of energy prices. Basic petrochemicals, which comprise the majority of organic chemical products, require energy input which can account for up to 85 percent of total production costs. The prices of natural gas and oil therefore influence the production costs and the selling price for these products. High basic petrochemical prices affect prices for chemical intermediates and final end products, including organic chemicals and plastics.

Another factor influencing prices for commodity chemical products is the cyclical nature of market supply and demand conditions. The Plastics, and Organic and Inorganic Chemical sectors are characterized by large capacity additions which can lead to fluctuations in prices in response to imbalances in supply and demand.

Figure 4B-2 shows the ***producer price index*** (PPI) at the 4-digit SIC code for the profiled chemical sectors. The PPI is a family of indexes that measure price changes from the perspective of the seller. This profile uses the PPI to express monetary values in constant dollars.

Figure 4B-2: Producer Price Indexes for Profiled Chemical Sectors



Source: BLS, 2000.

A recent sharp rise in prices for organic chemicals and plastics materials and resins is due in part to increases in the price of natural gas. Natural gas liquids are the feedstock for 70 percent of U.S. ethylene production, and the high natural gas prices are putting U.S. organic chemicals and, to a lesser extent, plastic resin producers at a disadvantage relative to foreign producers who rely on naphta and gas oil as a feedstock. Natural gas prices have declined recently, however, which will ease this pressure on U.S. producers (Chemical Market Reporter, 2001). Recent price increases for plastics and resins also reflect a shift by U.S. producers away from commodity resins to emphasize speciality and higher-value-added products (McGraw-Hill, 2000).

c. Number of facilities and firms

According to the Statistics of U.S. Businesses, the number of facilities in the Organic and Inorganic Chemical sectors remained relatively stable between 1989 and 1997. Table 4B-3 shows a downward trend in the number of facilities producing inorganic chemical products following a peak in 1991. This decrease is likely the result of the recent trend towards consolidation in the inorganic chemical sector. Consolidation is a means of paring costs with companies making acquisitions and consolidating operations in an attempt to reduce costs and achieve economies of scale (S&P, 2001).

While the number of producers in the Organic and Inorganic Chemical sectors has remained stable, the Plastics Material and Resins sector has experienced a significant increase in the number of facilities reported between 1993 and 1996, reflecting growth in the demand for plastics in a number of end-uses (McGraw-Hill, 2000).

Table 4B-3: Number of Facilities for Profiled Chemical Sectors[a]

Year	Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)		Plastics Material and Resins (SIC 2821)		Organic Chemicals (SIC 2865, 2869)	
	Number of Facilities	Percent Change	Number of Facilities	Percent Change	Number of Facilities	Percent Change
1989	1,387	n/a	504	n/a	844	n/a
1990	1,421	2%	517	3%	837	-1%
1991	1,508	6%	529	2%	851	2%
1992	1,466	-3%	460	-13%	888	4%
1993	1,476	1%	502	9%	908	2%
1994	1,460	-1%	499	-1%	902	-1%
1995	1,425	-2%	558	12%	907	1%
1996	1,396	-4%	630	26%	868	-4%
1997	1,414	1%	593	-6%	945	9%
Total Percent Change 1989-1997	*2%*		*18%*		*12%*	
Average Annual Growth Rate	*0.2%*		*2.1%*		*1.4%*	

[a] The Statistics of U.S. Business is derived from Census County Business Patterns data, and reports somewhat different numbers of firms and facilities than other Census data sources.

Source: U.S. SBA, 2000.

The trend in the number of firms between 1989 and 1997 has been similar to the number of facilities. The number of firms remained relatively stable for the Inorganic and Organic Chemical sectors. The Plastics Material and Resins sector experienced a significant increase in the number of firms reported between 1993 and 1997 from 284 to 358 firms.

Table 4B-4 shows the number of firms in the three profiled chemical sectors between 1990 and 1997.

Table 4B-4: Number of Firms for Profiled Chemical Sectors[a]

Year	Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)		Plastics Material and Resins (SIC 2821)		Organic Chemicals (SIC 2865, 2869)	
	Number of Firms	Percent Change	Number of Firms	Percent Change	Number of Firms	Percent Change
1990	640	n/a	301	n/a	579	n/a
1991	678	6%	319	6%	584	1%
1992	699	3%	255	-20%	611	5%
1993	683	-2%	284	11%	648	6%
1994	677	-1%	295	4%	644	-1%
1995	657	-3%	343	16%	644	0%
1996	625	-5%	403	17%	596	-7%
1997	611	-2%	358	-11%	674	13%
Total Percent Change 1990-1997	*-5%*		*19%*		*16%*	
Average Annual Growth Rate	*-0.7%*		*2.5%*		*2.2%*	

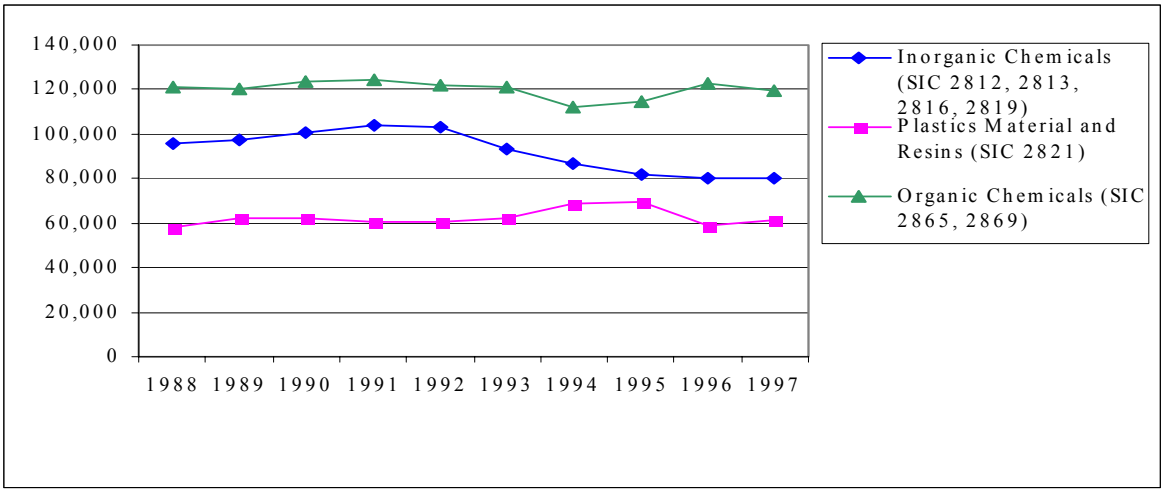
[a] The Statistics of U.S. Business is derived from Census County Business Patterns data, and reports somewhat different numbers of firms and facilities than other Census data sources.

Source: U.S. SBA, 2000.

d. Employment and productivity

Employment is a measure of the level and trend of activity in an industry. Figure 4B-3 below provides information on employment from the Annual Survey of Manufactures. With the exception of minor short-lived fluctuations, employment in the Organic Chemical and Plastics and Resins sectors remained stable between 1992 and 1996. The Inorganic Chemicals sector, however, experienced a significant decrease in employment from 103,400 to 80,200 employees over the same time period. This decrease reflects the industry's restructuring and downsizing efforts intended to reduce costs in response to competitive challenges.

Figure 4B-3: Employment for Profiled Chemical Sectors



Source: U.S. DOC, 1988-1991 and 1993-1996; U.S. DOC, 1987, 1992, and 1997.

Table 4B-5 presents the change in value added per labor hour, a measure of ***labor productivity***, for each of the profiled industry sectors between 1988 and 1997. The trends in each sector, particularly Plastic Materials and Resins and Organic Chemicals, show considerable volatility throughout the early and mid 1990s. The gains in productivity in the Inorganic Chemicals sector reflect facilities' attempts to reduce costs by restructuring production and materials handling processes in response to maturing domestic markets and increased global competition (S&P, 2001).

Table 4B-5: Productivity Trends for Profiled Chemical Sectors (in millions, constant $2000)

Year	Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)				Plastics Material and Resins (SIC 2821)				Organic Chemicals (SIC 2865, 2869)			
	Value Added	Prod. Hours (mill.)	Value Added/Hour		Value Added	Prod. Hours (mill.)	Value Added/Hour		Value Added	Prod. Hours (mill.)	Value Added/Hour	
			No.	% Change			No.	% Change			No.	% Change
1988	16,514	114	145	n/a	15,057	80	189	n/a	39,697	152	262	n/a
1989	16,785	109	154	6%	14,491	84	173	-8%	40,649	155	263	1%
1990	18,424	115	161	4%	14,363	83	174	1%	40,509	156	260	-1%
1991	17,900	121	148	-8%	13,120	81	162	-7%	36,170	156	232	-11%
1992	19,219	120	160	8%	15,576	79	198	22%	36,332	155	234	1%
1993	18,339	108	170	6%	14,845	81	183	-8%	37,945	156	243	4%
1994	17,183	101	170	0%	18,260	89	204	11%	41,052	146	282	16%
1995	17,026	100	170	0%	18,193	92	199	-3%	37,741	148	256	-9%
1996	16,246	97	168	-1%	16,815	81	209	5%	30,666	158	194	-24%
1997	17,367	91	191	14%	17,931	82	219	5%	39,391	152	260	34%
Total Percent Change 1988-1997	*5%*	*-20%*	*32%*		*19%*	*3%*	*16%*		*-1%*	*0%*	*-1%*	
Average Annual Percent Change	*1%*	*-2%*	*3%*		*2%*	*0.3%*	*2%*		*-0.1%*	*0%*	*-0.1%*	

Source: U.S. DOC, 1988-1991 and 1993-1996; U.S. DOC, 1987, 1992, and 1997.

e. Capital expenditures

The chemicals industry is relatively capital-intensive, with aggregate capital spending of $33.6 billion in 1999 (S&P, 2001). Capital-intensive industries are characterized by large, technologically complex manufacturing facilities which reflect the economies of scale required to manufacture products efficiently. ***New capital expenditures*** are needed to extensively modernize, expand, and replace existing capacity to meet growing demand. All three profiled chemical industry sectors have experienced substantial increases in capital expenditures over the past eleven years. Table 4B-6 shows that capital expenditures in the Inorganic Chemicals, the Plastics, and the Organic Chemicals sectors have increased by 98, 79, and 30 percent, respectively, over the past eleven years. Much of this growth in capital expenditures is driven by investment in capacity expansions to meet the increase in global demand for chemical products. Domestically, the continued substitution of synthetic materials for other basic materials and rising living standards has resulted in consistent growth in the demand for chemical commodities (S&P, 2001).

Table 4B-6: Capital Expenditures for Profiled Chemical Sectors (in millions, constant $2000)

Year	Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)		Plastics (SIC 2821)		Organic Chemicals (SIC 2865, 2869)	
	Capital Expenditures	Percent Change	Capital Expenditures	Percent Change	Capital Expenditures	Percent Change
1987	1,059	n/a	1,742	n/a	n/a	n/a
1988	1,076	2%	1,832	5%	4,760	n/a
1989	1,558	45%	2,193	20%	5,667	19%
1990	1,517	-3%	2,870	31%	7,179	27%
1991	1,581	4%	2,683	-7%	7,303	2%
1992	1,794	13%	2,128	-21%	6,714	-8%
1993	1,393	-22%	2,392	12%	5,748	-14%
1994	1,493	7%	3,026	27%	4,915	-14%
1995	1,787	20%	2,401	-21%	5,445	11%
1996	1,958	10%	3,057	27%	6,730	23%
1997	2,095	7%	3,118	2%	6,170	-8%
Total Percent Change 1987-1997	*98%*		*79%*		*30%*	
Average Annual Growth Rate	*7%*		*6%*		*3%*	

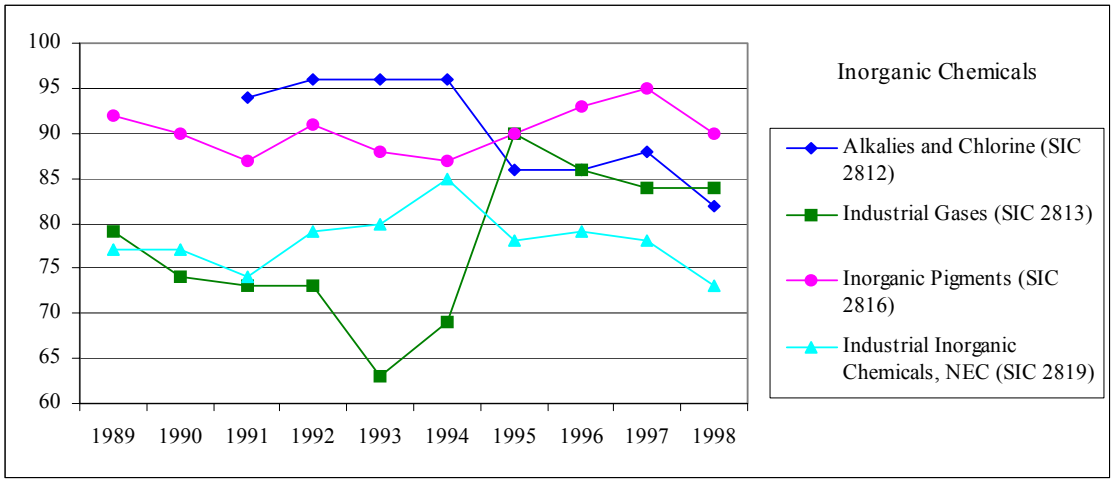
Source: U.S. DOC, 1988-1991 and 1993-1996; U.S. DOC, 1987, 1992, and 1997.

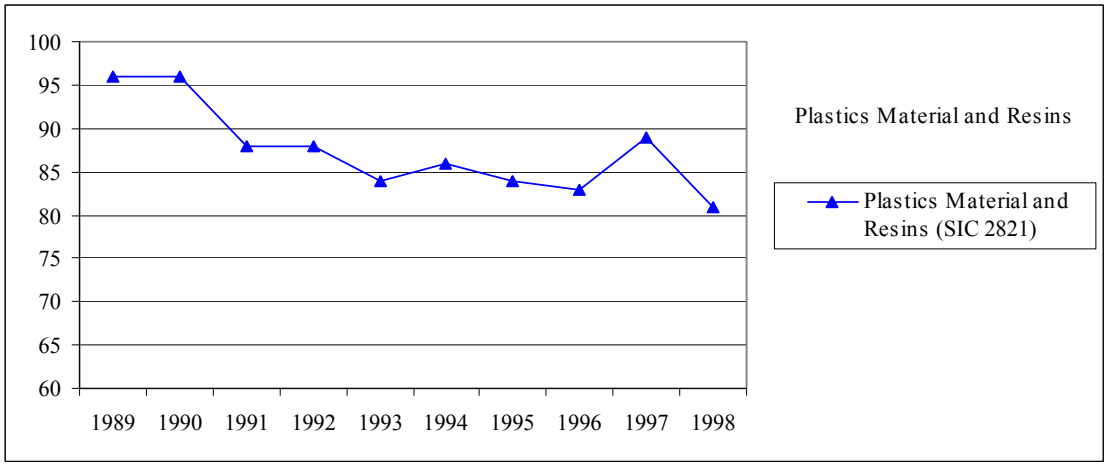
f. Capacity utilization

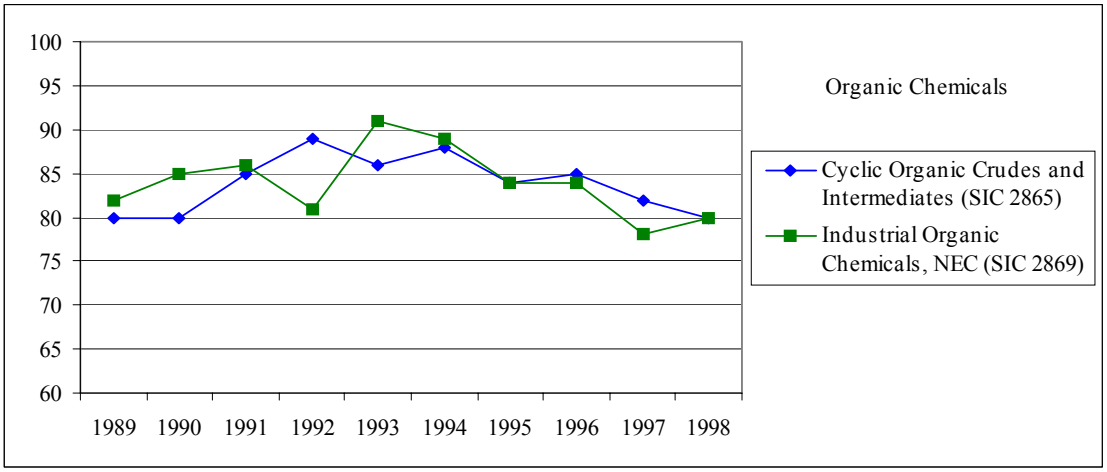
Capacity utilization measures actual output as a percentage of total potential output given the available capacity, and is used as a key barometer of an industry's health. Capacity utilization is an index used to identify potential excess or insufficient capacity in an industry which can help project whether new investment is likely. To take advantage of economies of scale, chemical commodities are typically produced in large facilities. Capacity additions in this industry are often made on a relatively large scale and can substantially affect the industry's capacity utilization rates. Figure 4B-4 presents the capacity utilization index from 1989 to 1998 for specific 4-digit SIC codes within each of the profiled sectors in the chemicals industry. Capacity utilization in the Organic Chemicals sector has remained stable throughout the 1990s with only moderate fluctuations between 1989 and 1998. Plastics and Resins capacity utilization has shown a downward trend, as the production of many commodity resins has shifted overseas. U.S. producers have responded by emphasizing the manufacture of speciality and higher-value-added products and by rationalizing capacity to improve profitability (McGraw-Hill, 2000).

Overall, the Inorganic Chemicals sector has demonstrated the most volatility in capacity utilization between 1989 and 1998. The chlor-alkali industry (SIC code 2812) has experienced an almost consistent decline in the capacity utilization index since its high of 96 percent from 1992 through 1994. This decrease reflects the enactment of treaties and legislation designed to reduce the emission of chlorinated compounds into the environment. These regulations decreased the demand for chlorine which, together with caustic soda, accounts for more than 75 percent of production by this sector. The significant increase in capacity utilization in the industrial gases sector (SIC code 2813) in the mid 1990s reflects the expansion of key end-use markets such as the chemicals, primary metals, and electronics industries. In contrast, capacity utilization in the pigments and other inorganic chemicals sectors (SIC codes 2816 and 2819) remained relatively stable between 1989 and 1998. The stability in these sectors reflects the fact that these are essentially mature markets where the demand for products tend to track growth in gross domestic product (GDP) (McGraw-Hill 2000).

Figure 4B-4: Capacity Utilization Rates (Fourth Quarter) for Profiled Chemical Sectors







Source: U.S. DOC, 1989-1998.

4B.2 Structure and Competitiveness

The chemicals industry continues to restructure and reduce costs in response to competitive challenges, including global oversupply for commodities. In the early 1990s, the chemical industry's cost-cutting came largely from restructuring and downsizing. The industry has taken steps to improve productivity, and consolidated to cut costs. In general, companies seeking growth within maturing industry sectors are making acquisitions to achieve production or marketing efficiencies. The Plastics Material and Resins sector (SIC code 282), for example, has recently experienced sizable consolidations (S&P, 2001).

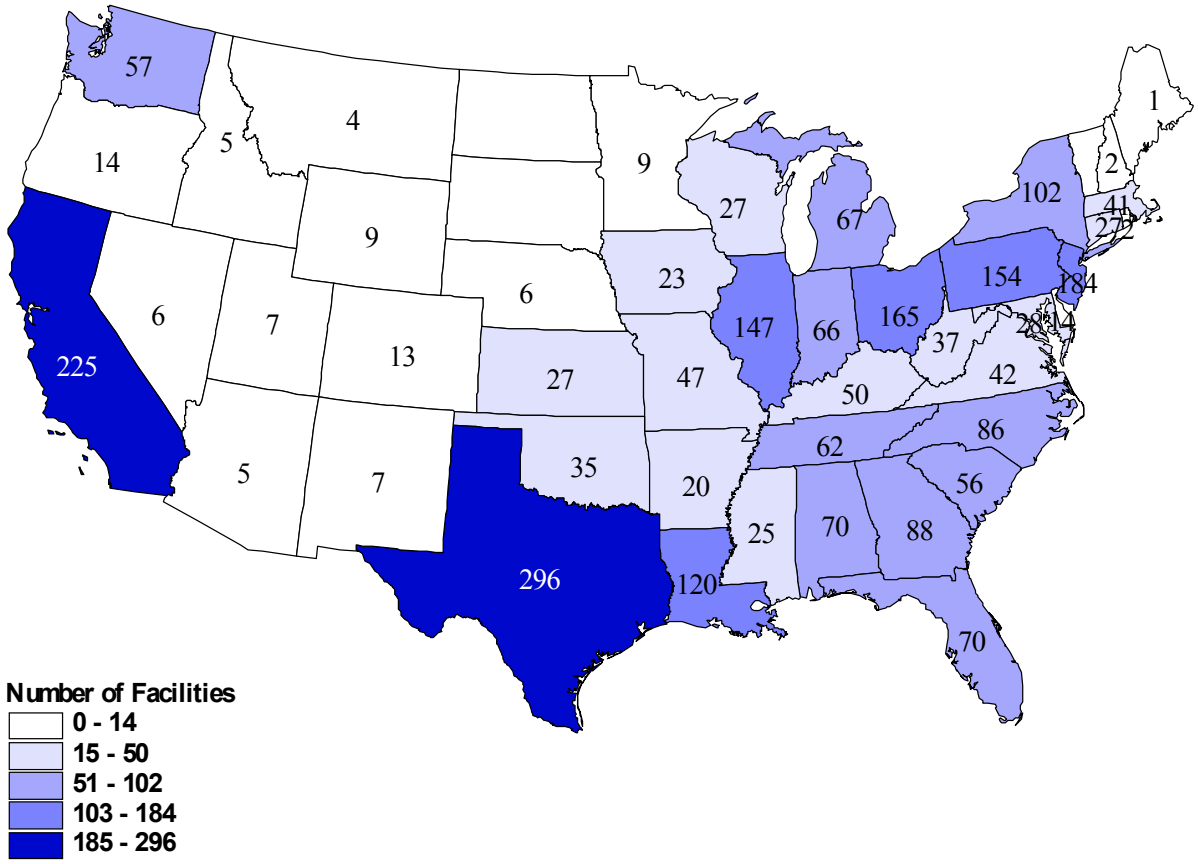
a. Geographic distribution

Chemical manufacturing facilities are located in every state but almost two-thirds of U.S. chemical production is concentrated in ten states. Given the low value of many commodity chemicals and the handling problems posed by products such as industrial gases, nearly two-thirds of the tonnage shipped was transported less than 250 miles in 1998 (S&P, 2001).

Facilities producing cyclic crudes and intermediates (SIC 2865) and unclassified industrial organic chemicals, not elsewhere classified (SIC 2869), are concentrated in Texas, New Jersey, Ohio, California, New York, and Illinois. Facility sites are typically chosen for their access to raw materials such as petroleum and coal products and to transportation routes. In addition, since much of the market for organic chemicals is the chemical industry, facilities tend to cluster near such end-users (U.S. EPA, 1995a).

Inorganic Chemical facilities (SIC 281) are typically located near consumers and, to a lesser extent, raw materials. The largest use of inorganic chemicals is in industrial processes for the manufacture of chemicals and nonchemical products. Facilities are therefore concentrated in the heavy industrial regions along the Gulf Coast, both East and West coasts, and the Great Lakes region. Since a large portion of the inorganic chemicals produced are used by the Organic Chemicals manufacturing industry, the geographical distribution of inorganic facilities is very similar to that of organic chemicals facilities (U.S. EPA, 1995b). Facilities in the Plastics Material and Resins sector (SIC 2821) are concentrated in the heavy industrial regions, similar to both the organic and inorganic chemicals facilities.

Figure 4B-5: Number of Chemical Facilities by State for Profiled Chemical Sectors



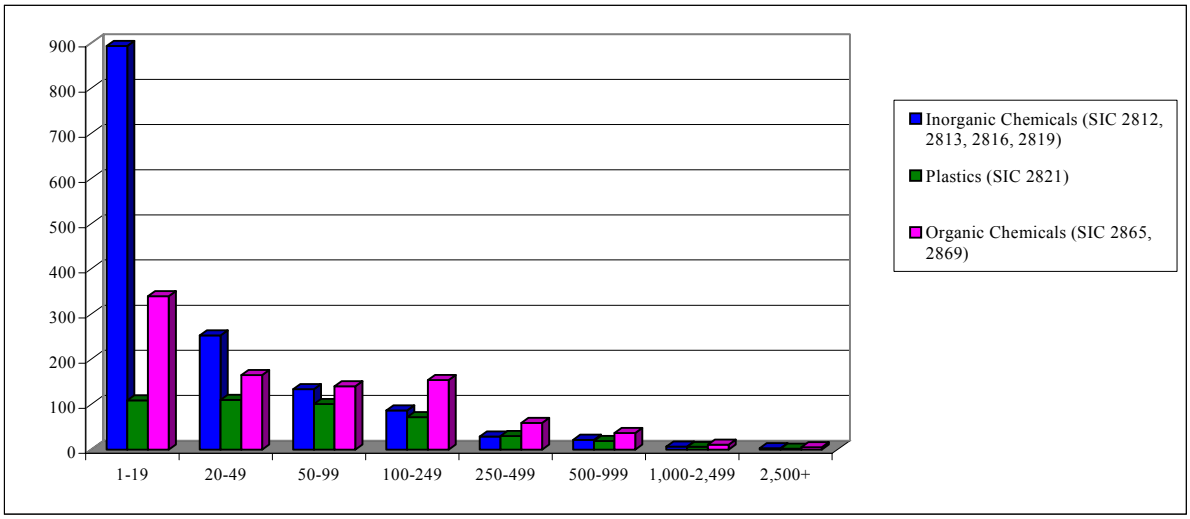
Source: U.S. DOC, 1987, 1992, and 1997.

b. Facility size

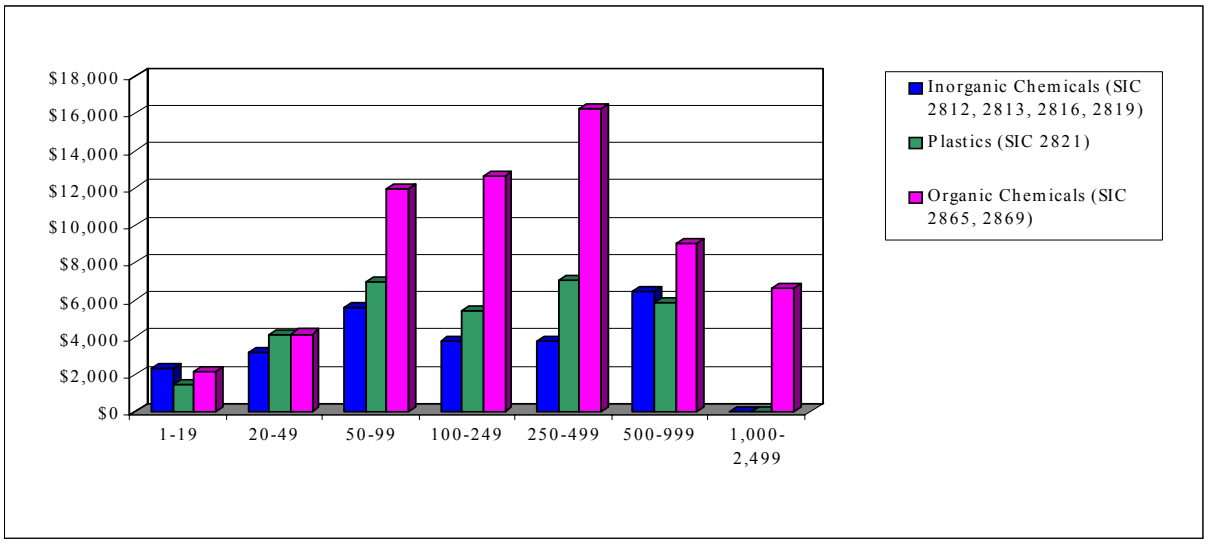
The three profiled chemicals industry sectors are characterized by a large number of small facilities, with more than 67 percent of facilities employing fewer than 50 employees and only eight percent employing 250 or more employees. However, the larger facilities in the three sectors account for the majority of the industries' output. This fact is most pronounced in the Inorganic Chemicals sector where facilities with fewer than 20 employees account for 63 percent of all facilities but for only 8 percent of the industry's value of shipments. In the Organic Chemicals sector, approximately 29 percent of all facilities employ 100 employees or more. These facilities account for about 87 percent of the value of shipments for the industry. Similarly, facilities in the Plastics Industry with more than 100 employees account for only 29 percent of all facilities but for 80 percent of the industry's value of shipments (see Figure 4B-6 below).

Figure 4B-6: Number of Facilities and Value Added by Employment Size Category in 1992 for Profiled Chemical Sectors

Number of Facilities (1992)



1992 Value of Shipments (in millions)



Source: U.S. DOC, 1987, 1992, and 1997.

c. Firm size

The Small Business Administration (SBA) defines small firms in the chemical industries according to the firm's number of employees. Firms in the Inorganic Chemicals sector (SIC codes 2812, 2813, 2816, 2819) and in Industrial Organic Chemicals, NEC (SIC code 2869) are defined as small if they have 1,000 or fewer employees; firms in Plastics Material and Resins (SIC 2821) and Cyclic Organic Crudes and Intermediates (SIC code 2865) are defined as small if they have 750 or fewer employees.

The size categories reported in the Statistics of U.S. Businesses (SUSB) do not coincide with the SBA small firm standards of 750 and 1,000 employees. It is therefore not possible to apply the SBA size thresholds precisely. The SUSB data presented in Table 4B-6 show that in 1997, 475 of 611 firms in the Inorganic Chemicals sector had less than 500 employees. Therefore, at least 78 percent of firms in this sector were classified as small. These small firms owned 524 facilities, or 37 percent of all facilities in the sector. In the Plastics and Resins Industry sector, 272 of 358 firms, or 76 percent, had less than 500 employees in 1997. These small firms owned 294 of 593 facilities (50 percent) in the sector. In the Organic Chemicals Industry sector, 74 percent of facilities (496 of 674) had fewer than 500 employees, owning 57 percent of all facilities in that sector.

Table 4B-7 below shows the distribution of firms, facilities, and receipts in the Inorganic Chemicals, Plastics Material and Resins, and Organic Chemicals sectors by the employment size of the parent firm.

Table 4B-7: Number of Firms, Facilities and Estimated Receipts by Firm Size Category for Profiled Chemical Sectors (1997)

Employment Size Category	Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)			Plastics Material and Resins (SIC 2821)			Organic Chemicals (SIC 2865, 2869)		
	No. of Firms	Number of Facilities	Estimated Receipts (in millions, constant $2000)	No. of Firms	Number of Facilities	Estimated Receipts (in millions, constant $2000)	No. of Firms	Number of Facilities	Estimated Receipts (in millions, constant $2000)
0-19	294	299	396	120	120	477	255	255	670
20-99	122	137	1,291	108	111	1,399	148	160	2,752
100-499	59	88	2,700	44	63	3,141	93	121	5,053
500+	136	890	3,606	86	299	5,548	178	409	9,908
Total	*611*	*1,414*	*7,993*	*358*	*593*	*10,565*	*674*	*945*	*18,383*

Source: U.S. SBA, 2000.

d. Concentration and specialization ratios

Concentration is the degree to which industry output is concentrated in a few large firms. Concentration is closely related to entry barriers with more concentrated industries generally having higher barriers.

The four-firm ***concentration ratio*** (CR4) and the ***Herfindahl-Hirschman Index*** (HHI) are common measures of industry concentration. The CR4 indicates the market share of the four largest firms. For example, a CR4 of 72 percent means that the four largest firms in the industry account for 72 percent of the industry's total value of shipments. The higher

the concentration ratio, the less competition there is in the industry, other things being equal.[2] An industry with a CR4 of more than 50 percent is generally considered concentrated. The HHI indicates concentration based on the largest 50 firms in the industry. It is equal to the sum of the squares of the market shares for the largest 50 firms in the industry. For example, if an industry consists of only three firms with market shares of 60, 30, and 10 percent, respectively, the HHI of this industry would be equal to 4,600 ($60^2 + 30^2 + 10^2$). The higher the index, the fewer the number of firms supplying the industry and the more concentrated the industry. An industry is considered concentrated if the HHI exceeds 1,000.

Of the profiled Chemicals and Allied Products, only Alkalies and Chlorine (SIC 2812), Industrial Gases (SIC 2813), and Inorganic Pigments (SIC 2816) would be considered highly concentrated based on their CR4 and HHI values. In contrast, Industrial Inorganic Chemicals, NEC (SIC 2819), Plastics Material and Resins (SIC 2821), Cyclic Crudes and Intermediates (SIC 2865), and Industrial Organic Chemicals, NEC (SIC 2869) would be considered competitive. The diversity of products in some of the profiled sectors, however, make generalizations about concentration less reliable than in industries with a more limited product slate. There could be significant variations in the numbers of producers of individual products within the SICs with numerous products (e.g. SIC 2869, Industrial Organic Chemicals, not elsewhere classified).

The ***specialization ratio*** is the percentage of the industry's production accounted for by primary product shipments. The ***coverage ratio*** is the percentage of the relevant product shipments that are produced as primary products by facilities in the comparable SIC. The specialization ratios presented in Table 4B-8 indicate a relatively high degree of specialization for each profiled chemical industry sector. The coverage ratios indicate that the facilities classified in the profiled SICs produce more than 80 percent of the relevant products as primary products, except for SIC 2812 (Alkalies and Chlorine) and 2865 (Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments), where a larger portion of the relevant products produced are produced by facilities classified in other SICs.

[2] Note that the measured concentration ratio and the HHF are very sensitive to how the industry is defined. An industry with a high concentration in domestic production may nonetheless be subject to significant competitive pressures if it competes with foreign producers or if it competes with products produced by other industries (e.g., plastics vs. aluminum in beverage containers). Concentration ratios are therefore only one indicator of the extent of competition in an industry.

Table 4B-8: Selected Ratios for Four-Digit SIC Codes for Profiled Chemical Sectors

SIC Code	Year	Concentration Ratios					Specialization Ratio	Coverage Ratio
		4 Firm (CR4)	8 Firm (CR8)	20 Firm (CR20)	50 Firm (CR50)	Herfindahl-Hirschman Index		
Inorganic Chemicals								
2812	87	72%	93%	99%	100%	2,328	86%	65%
	92	75%	90%	99%	100%	1,994	76%	75%
2813	87	77%	88%	95%	98%	1,538	98%	94%
	92	78%	91%	96%	99%	1,629	96%	94%
2816	87	64%	76%	94%	99%	1,550	94%	89%
	92	69%	79%	93%	99%	1,910	95%	89%
2819	87	38%	49%	68%	84%	468	91%	80%
	92	39%	50%	68%	85%	677	91%	82%
Plastics Material and Resins								
2821	87	20%	33%	61%	89%	248	88%	81%
	92	24%	39%	63%	90%	284	86%	80%
Organic Chemicals								
2865	87	34%	50%	77%	96%	542	80%	61%
	92	31%	45%	72%	94%	428	86%	61%
2869	87	31%	48%	68%	86%	376	75%	84%
	92	29%	43%	67%	86%	336	76%	85%

Source: U.S. DOC, 1987, 1992, and 1997.

e. Foreign trade

The chemicals industry is the largest exporter in the United States. The industry generates more than 10 percent of the nation's total exports, and overseas sales constitute a growing share of U.S. chemical company revenues. The major U.S. producers still derive 50 percent or more of their revenue from domestic sales, however (S&P, 2001).

This profile uses two measures of foreign competitiveness: ***export dependence*** and ***import penetration***. Export dependence is the share of value of shipments that is exported. Import penetration is the share of domestic consumption met by imports. Table 4B-9 presents trade statistics for each of the profiled chemical sectors. Both export dependence and import penetration have experienced modest positive trends in each of these sectors between 1989 and 1996. Globalization of the market has become a key factor influencing foreign competitiveness in the Inorganic Chemicals sector (SIC 281). In recent years import penetration has been increasing at a slightly higher rate than export dependence in this sector due to a strengthened U.S. dollar, weakness in the European and Japanese markets, and increased production in lower-cost developing nations (McGraw-Hill, 2000). Increased globalization has also been a dominant trend affecting trade statistics in the Plastics Material and Resins sector (SIC 2821). Imports and exports of plastics and resins have increased significantly over the past eight years reflecting the continued growth in the global market. Import penetration has grown more quickly than export dependence in this sector due to declining export opportunities and increased competition from imports driven by increased foreign capacity. The U.S. remained a net exporter of plastics and resins, despite these trends. The market for organic

chemicals, particularly petrochemicals, has become increasingly competitive. Significant capacity expansions for petrochemicals worldwide have increased competition from imports and begun to limit export opportunities. Nevertheless, exports in Organic Chemicals (SIC 2865, 2869) remained slightly higher than imports between 1989 and 1996.

Table 4B-9: Trade Statistics for Profiled Chemical Sectors

Year	Value of imports (in millions, constant $2000)	Value of exports (in millions, constant $2000)	Value of shipments (in millions, constant $2000)	Implied Domestic Consumption[a]	Import Penetration[b]	Export Dependence[c]
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Inorganic Chemicals, Except Pigments (SIC 2812, 2813, 2819)						
1989	5,107	5,798	26,306	25,615	20%	22%
1990	5,185	5,590	28,442	28,036	18%	20%
1991	5,145	5,993	28,164	27,316	19%	21%
1992	5,150	6,341	30,560	29,368	18%	21%
1993	4,973	5,938	30,214	29,249	17%	20%
1994	5,410	5,994	31,591	31,007	17%	19%
1995	5,650	6,226	30,623	30,047	19%	20%
1996	5,972	6,089	28,612	28,494	21%	21%
Total Percent Change 1989-1996	*16.9%*	*5.0%*	*8.8%*	*11.2%*		
Average Annual Growth Rate	*2.0%*	*0.6%*	*1.1%*	*1.3%*		
Plastics Materials and Resins (SIC 2821)						
1989	1,732	6,157	37,095	32,670	5%	17%
1990	2,133	7,376	36,895	31,651	7%	20%
1991	2,115	8,796	35,226	28,544	7%	25%
1992	2,570	8,735	39,023	32,859	8%	22%
1993	3,127	8,918	39,176	33,385	9%	23%
1994	3,914	10,055	44,511	38,370	10%	23%
1995	4,220	10,682	44,980	38,518	11%	24%
1996	4,586	11,627	44,037	36,996	12%	26%
Total Percent Change 1989-1996	164.8%	88.8%	18.7%	13.2%		
Average Annual Growth Rate	15.0%	10.0%	2.0%	2.0%		

Table 4B-9: Trade Statistics for Profiled Chemical Sectors

Year	Value of imports (in millions, constant $2000)	Value of exports (in millions, constant $2000)	Value of shipments (in millions, constant $2000)	Implied Domestic Consumption[a]	Import Penetration[b]	Export Dependence[c]
(a)	(b)	(c)	(d)	(e)	(f)	(g)
Organic Chemicals, Except Gum & Wood (SIC 2865, 2869)						
1989	7,464	12,710	90,496	85,249	9%	14%
1990	8,108	12,654	91,856	87,309	9%	14%
1991	8,416	12,943	87,940	83,413	10%	15%
1992	9,307	12,954	89,251	85,605	11%	15%
1993	9,464	13,492	90,847	86,819	11%	15%
1994	11,004	15,747	97,130	92,387	12%	16%
1995	11,367	16,801	84,391	78,956	14%	20%
1996	12,344	15,190	80,719	77,872	16%	19%
Total Percent Change 1989-1996	*65.4%*	*19.5%*	*-10.8%*	*-8.7%*		
Average Annual Growth Rate	7.5%	2.6%	-1.6%	-1.3%		

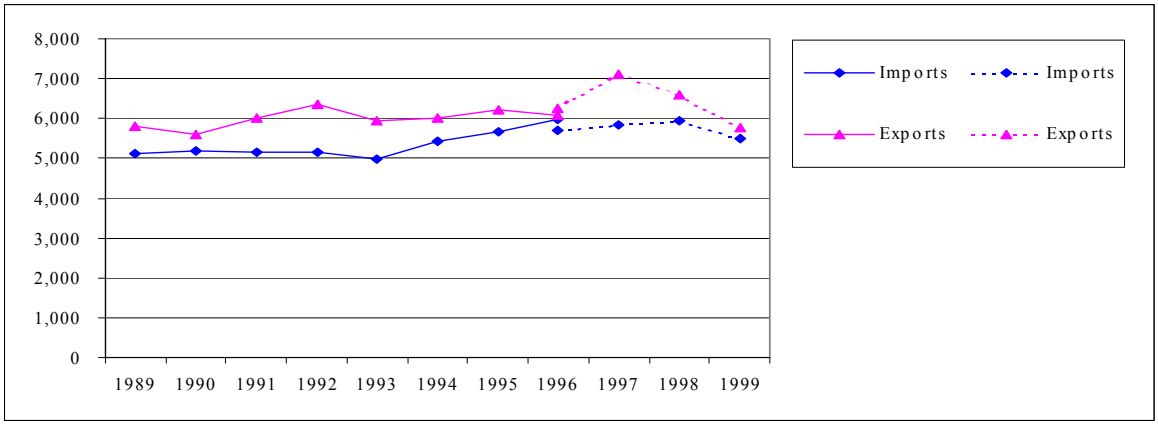
[a] Calculated by EPA as shipments + imports - exports.
[b] Calculated by EPA as imports divided by implied domestic consumption.
[c] Calculated by EPA as exports divided by shipments.

Source: U.S. DOC, 1997.

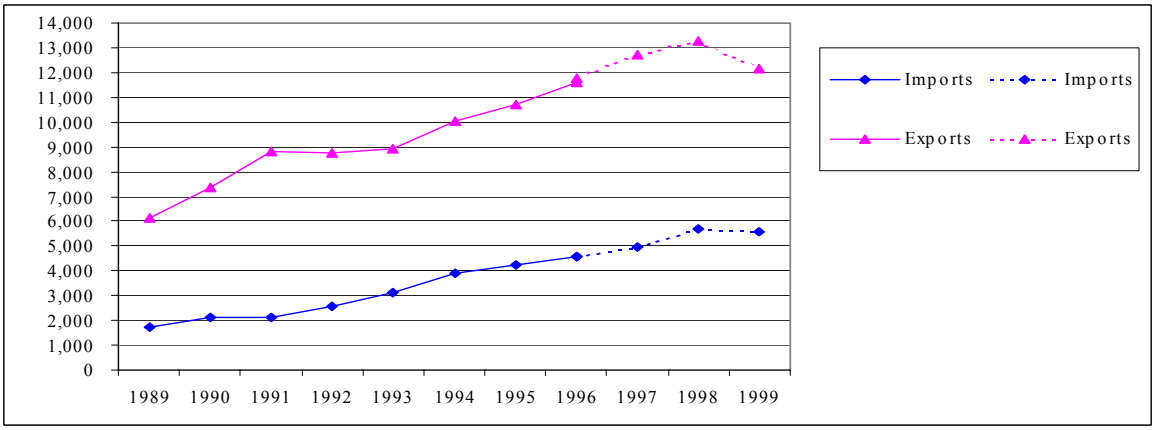
More recent export and import data shown in Figure 4B-7 show declines in the real value of both exports and imports of inorganic chemicals and plastics and resins in 1999. Exports and imports of organic chemicals rose in 1999. The chemicals industry experienced a decline in its trade balance in 2000, due to increased imports form Western Europe, encouraged by the strong U.S. dollar relative to the Euro, and growth in the petrochemical industry in the Middle East. Recent declines in the dollar relative to the Euro are expected to improve export performance, but declines in the global economy are resulting in mixed trade performance in 2001 (Chemical Market Reporter, 2001).

Figure 4B-7: Value of Imports and Exports for Profiled Chemical Sectors (in millions, constant $2000)

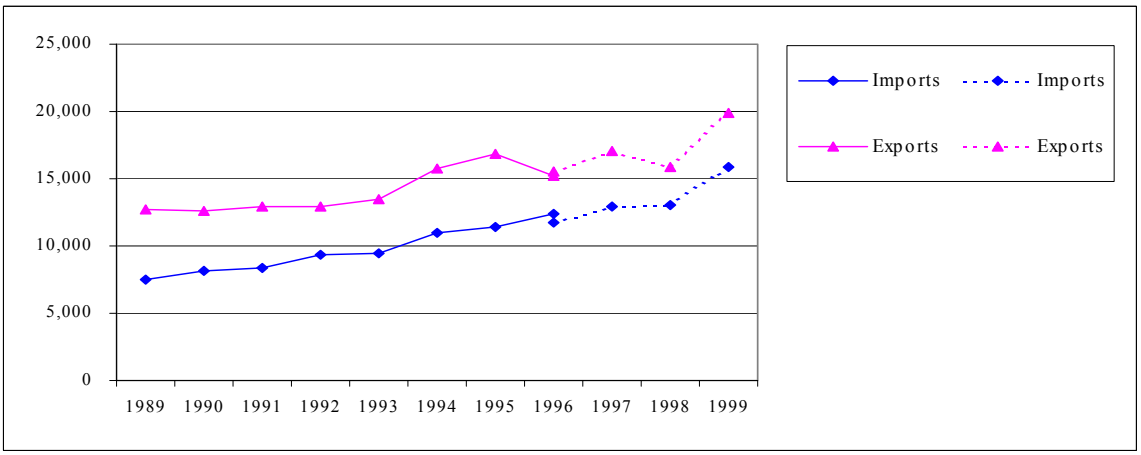
Inorganic Chemicals, Except Pigments (SIC 2812, 2813, 2819)



Plastics Materials and Resins (SIC 2821)



Organic Chemicals, Except Gum & Wood (SIC 2865, 2869)



Source: U.S. DOC, 2000; U.S. DOC, 1997.

4B.3 Financial Condition and Performance

The chemical industry is generally characterized by large plant sizes and technologically complex production processes reflecting the economies of scale required to manufacture chemicals efficiently. Because of the high fixed costs associated with chemical manufacturing operations, larger production volumes are required to spread these costs over a greater number of units in order to maintain profitability. ***Operating margins*** for chemical producers are generally volatile due to rapid changes in selling prices, raw material costs, energy costs, and production levels. Other factors that affect margins for chemical producers include costs associated with businesses recently acquired or divested, major new capacity additions, or environmental costs (S&P, 2001).

Facing increased global competition, the U.S. chemical industry has restructured and reduced costs to maintain profitability and operating margins. Cost-cutting efforts in the early 1990s came largely from restructuring and downsizing, particularly in the Inorganic Chemicals sector. The industry has recently shifted toward consolidation as a means of paring costs by achieving production or marketing efficiencies while maintaining growth in maturing markets (S&P, 2001). These transactions are typically small scale involving individual product lines or facilities and are most common in the Organic Chemical and Plastics and Resins Industry sectors.

Table 4B-10 presents operating margins for each of the profiled chemical sectors between 1987 and 1997.

Table 4B-10: Operating Margins for Profiled Chemical Sectors (in millions, constant $2000)				
Year	**Value of Shipments**	**Cost of Materials**	**Payroll (all employees)**	**Operating Margin**
Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)				
1987	26,306	11,335	4,083	41.4%
1988	28,442	12,102	4,175	42.8%
1989	28,164	11,485	4,042	44.9%
1990	30,560	12,754	4,375	43.9%
1991	30,214	12,397	4,617	43.7%
1992	31,591	12,428	4,850	45.3%
1993	30,623	12,306	4,506	45.1%
1994	28,612	11,380	4,222	45.5%
1995	27,913	1,108	3,817	46.9%
1996	27,223	11,097	3,675	45.7%
1997	28,593	11,144	3,784	47.8%
Plastics Material and Resins (SIC 2821)				
1987	36,668	21,530	2,802	33.6%
1988	36,637	22,059	2,476	33.0%
1989	37,095	22,635	2,658	31.8%
1990	36,895	22,838	2,928	30.2%
1991	35,226	22,153	2,955	28.7%
1992	39,023	23,485	3,330	31.3%
1993	39,176	24,217	3,476	29.3%
1994	44,511	26,363	3,741	32.4%
1995	44,902	27,109	3,422	32.0%
1996	44,037	27,269	3,146	30.9%
1997	47,587	29,794	3,346	30.4%
Organic Chemicals (SIC 2865, 2869)				
1988	88,009	49,088	6,777	36.5%
1989	90,496	50,166	6,649	37.2%
1990	91,856	52,098	7,219	35.4%
1991	87,940	51,527	7,382	33.0%
1992	89,251	53,169	7,564	32.0%
1993	90,847	52,858	7,847	33.2%
1994	97,130	56,191	7,722	34.2%
1995	84,607	47,402	6,497	36.3%
1996	80,719	50,203	7,199	28.9%
1997	90,811	51,430	1,975	35.7%

Source: U.S. DOC, 1988-1991 and 1993-1996; U.S. DOC, 1987, 1992, and 1997.

4B.4 Facilities Operating Cooling Water Intake Structures

In 1982, the Chemical and Allied Products industry withdrew 2,797 billion gallons of cooling water, accounting for approximately 3.6 percent of total industrial cooling water intake in the United States. The industry ranked 2nd in industrial cooling water use behind the electric power generation industry (1982 Census of Manufactures).

This section presents information from EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* on existing facilities with the following characteristics:

- they withdraw from a water of the United States;
- they hold an NPDES permit;
- they have a design intake flow of equal to or greater than two MGD;
- they use at least 25 percent of that flow for cooling purposes.

These facilities are not "new facilities" as defined by the proposed section 316(b) New Facility Rule and are therefore not subject to this regulation. However, they meet the criteria of the proposed rule except that they are already in operation. These existing facilities therefore provide a good indication of what new facilities in these sectors may look like. The remainder of this section refers to existing facilities with the above characteristics as "section 316(b) facilities."

a. Cooling water uses and systems

Information collected in the Detailed Questionnaire found that an estimated 61 out of 435 inorganic chemical facilities (14 percent), 15 out of 305 plastics facilities (5 percent), and 52 out of 427 organic chemical facilities (12 percent) meet the characteristics of a section 316(b) facility. Most section 316(b) facilities in the profiled Chemical and Allied Products sectors use cooling water for contact and non-contact production line or process cooling, electricity generation, and air conditioning:

- Ninety-eight percent (60 facilities) of section 316(b) *inorganic chemical* facilities use cooling water for production line (or process) contact or noncontact cooling. The two other major uses of cooling water are electricity generation and air conditioning, at 28 and 23 percent of facilities, respectively.

- All section 316(b) *plastics* facilities use cooling water for production line (or process) contact or noncontact cooling. Sixty-seven and 40 percent of facilities use cooling water for air conditioning and other uses, respectively. None of the section 316(b) plastics facilities use cooling water for electricity generation.

- All fifty-two section 316(b) *organic chemicals* facilities use cooling water for production line (or process) contact or noncontact cooling. Twenty-three percent (12 facilities) use cooling water for air conditioning, and 6 percent (3 facilities) use cooling water for electricity generation.

Table 4B-11 shows the distribution of existing section 316(b) facilities in the profiled chemical sectors by type of water body and cooling system. The table shows that most of the existing section 316(b) facilities have either a once-through system (65, or 51 percent) or employ a combination of a once through and a recirculating system (28, or 22 percent). The majority of existing facilities draw water from a freshwater stream or river (99, or 77 percent). All 316(b) in the three profiled chemical sectors that withdraw water from an ocean have a once though cooling system, while all facilities withdrawing from a lake or reservoir employ a combination of a once-through and a recirculating system.

Table 4B-11: Number of Section 316(b) Facilities by Water Body and Cooling System Type for Profiled Chemical Sectors

Water Body Type	Cooling System										
	Recirculating		Once-Through		Combination		None		Other		Total
	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	Number	% of Total	
Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)											
Estuary or Tidal River	0	0%	4	31%	9	69%	0	0%	0	0%	13
Estuary or Tidal River & Lake or Reservoir	0	0%	1	100%	0	0%	0	0%	0	0%	1
Freshwater Stream or River	9	26%	21	62%	0	0%	0	0%	4	12%	34
Lake or Reservoir	0	0%	0	0%	4	100%	0	0%	0	0%	4
Ocean	0	0%	9	100%	0	0%	0	0%	0	0%	9
Total[a]	***9***	***15%***	***35***	***57%***	***13***	***21%***	***0***	***0%***	***4***	***7%***	***61***
Plastics Material and Resins (SIC 2821)											
Freshwater Stream or River	0	0%	0	0%	9	69%	4	31%	0	0%	13
Lake or Reservoir	0	0%	0	0%	2	100%	0	0%	0	0%	2
Total[a]	***0***	***0%***	***0***	***0%***	***11***	***73%***	***4***	***27%***	***0***	***0%***	***15***
Organic Chemicals (SIC 2865, 2869)											
Freshwater Stream or River	9	17%	30	58%	4	8%	0	0%	9	17%	52
Total[a]	***9***	***17%***	***30***	***58%***	***4***	***8%***	***0***	***0%***	***9***	***17%***	***52***
Total for Profiled Chemical Facilities (SIC 28)											
Estuary or Tidal River	0	0%	4	31%	9	69%	0	0%	0	0%	13
Estuary or Tidal River & Lake or Reservoir	0	0%	1	100%	0	0%	0	0%	0	0%	1
Freshwater Stream or River	18	18%	51	52%	13	13%	4	4%	13	13%	99
Lake or Reservoir	0	0%	0	0%	6	100%	0	0%	0	0%	6
Ocean	0	0%	9	100%	0	0%	0	0%	0	0%	9
Total[a]	**18**	**14%**	**65**	**51%**	**28**	**22%**	**4**	**3%**	**13**	**10%**	**128**

[a] Individual numbers may not add up to total due to independent rounding.

Source: U.S. EPA, 2000.

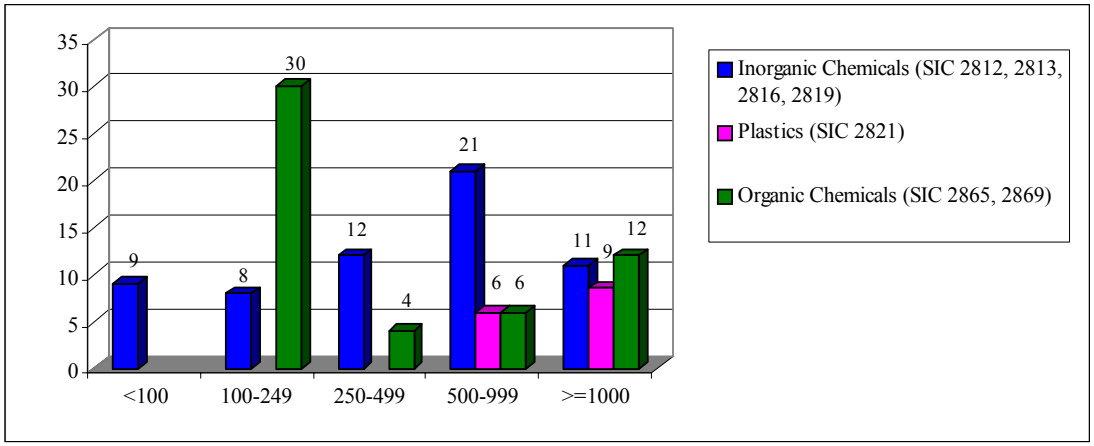
b. Facility size

Chemical facilities that withdraw more than two MGD from a water of the U.S., hold an NPDES permit, and use at least 25 percent of intake water for cooling purposes are generally larger than facilities that do not meet these criteria:

- Fifty-two percent of the section 316(b) facilities in the Inorganic Chemicals sector have greater than 500 employees, while 28 percent of these facilities employ less than 100 employees.
- All of section 316(b) plastics facilities employ at least 500 employees, and 60 percent employ over 1,000 employees.
- All section 316(b) organic chemical facilities employ more than 100 employees, and the largest number (30, or 58 percent) of facilities are in the employment size category of 100 to 259 employees. Thirty-five percent of the section 316(b) organic chemical facilities employ more than 500 employees.

Figure 4B-8 shows the number of section 316(b) facilities in the profiled chemical sectors by employment size category.

Figure 4B-8: Number of Section 316(b) Facilities by Employment Size Category for Profiled Chemical Sectors



Source: U.S. EPA, 2000.

c. Firm size

EPA used the Small Business Administration (SBA) small entity size standards to determine the number of existing section 316(b) facilities in the three profiled chemical sectors that are owned by small firms. Firms in the Inorganic Chemicals sector (SIC codes 2812, 2813, 2816, 2819) and in Industrial Organic Chemicals, NEC (SIC code 2869) are defined as small if they have 1,000 or fewer employees; firms in Plastics Material and Resins (SIC 2821) and Cyclic Organic Crudes and Intermediates (SIC code 2865) are defined as small if they have 750 or fewer employees.

Table 4B-12 shows that, of the 61 section 316(b) facilities in the Inorganic Chemicals sector, four, or 7 percent, are owned by a small firm. All four of these firms are in SIC 2816. None of the 15 section 316(b) facilities in the Plastics sector are owned by a small firm. Ninety-two percent of the section 316(b) facilities in the Organic Chemicals sector are classified as large. SIC 2869 accounts for all of the facilities owned by small firms in the Organic Chemicals sector. Overall, the profiled chemicals sector has 120 facilities (94 percent) owned by large firms, and 8 facilities (8 percent) owned by small firms.

Table 4B-12: Number of Section 316(b) Facilities by Firm Size for Profiled Chemical Sectors

SIC Code	Large		Small		Total
	No.	% of SIC	No.	% of SIC	
Inorganic Chemicals (SIC 2812, 2813, 2816, 2819)					
2812	20	100%	0	0%	20
2813	4	100%	0	0%	4
2816	0	0%	4	100%	4
2819	33	100%	0	0%	33
Total	***57***	***93%***	***4***	***7%***	***61***
Plastics Material and Resins (SIC 2821)					
2821	15	100%	0	0%	15
Organic Chemicals (SIC 2865, 2869)					
2865	4	100%	0	0%	4
2869	44	91%	4	9%	48
Total	***48***	***92%***	***4***	***8%***	***52***
Total for Profiled Chemical Facilities (SIC 28)					
Total	**120**	**94%**	**8**	**6%**	**128**

Source: U.S. EPA, 2000; D&B, 2001.

REFERENCES

Bureau of Labor Statistics (BLS). 2000. *Producer Price Index*. Series: PCU28__#–Chemicals and Allied Products.

Business Weekly. 2001. "Materials: Plastics." p. 125. January 8,2001.

Chemical Marketing Reporter. 2001. "U.S. Chemical Industry Outlook: Trade and Domestic Demand". v260, issue 25, p. 33. June 18, 2001.

Dun and Bradstreet (D&B). 2001. Data extracted from D&B Webspectrum August 2001.

Executive Office of the President. 1987. Office of Management and Budget. *Standard Industrial Classification Manual.*

Federal Reserve Board. 2001. *Industrial Production and Capacity Utilization.* Statistical Release G.17. October 16, 2001.

Kline & Company, Inc. 1999. *Guide to the U.S. Chemical Industry,* 6th edition.

McGraw-Hill and U.S. Department of Commerce, International Trade Administration. 2000. *U.S. Industry & Trade Outlook '00.*

Standard & Poor's. (S&P) 2001. *Industry Surveys - Chemicals: Basic.* July 5, 2001.

U.S. Department of Commerce (U.S. DOC). 1997. International Trade Administration. *Outlook Trends Tables*.

U.S. Department of Commerce (U.S. DOC). 2000. Bureau of the Census. Foreign Trade Data.

U.S. Department of Commerce (U.S. DOC). 1989-1998. Bureau of the Census. Current Industrial Reports. *Survey of Plant Capacity*.

U.S. Department of Commerce (U.S. DOC). 1988-1991 and 1993-1996. Bureau of the Census. *Annual Survey of Manufactures.*

U.S. Department of Commerce (U.S. DOC). 1987, 1992, and 1997. Bureau of the Census. *Census of Manufactures*.

U.S. Environmental Protection Agency (U.S. EPA). 2000. *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures*.

U.S. Environmental Protection Agency (U.S. EPA). 1995a. *Profile of the Organic Chemicals Industry*. September, 1995.

U.S. Environmental Protection Agency (U.S. EPA). 1995b. *Profile of the Inorganic Chemical Industry*. September, 1995.

U.S. Small Business Administration (U.S. SBA). 2000. *Small Business Size Standards*. 13 CFR section 121.201.

Value Line. 2001a. "Chemical (Basic) Industry." p. 1233. July 27, 2001.

Value Line. 2001b. "Chemical / Diversified Industry." p. 1961. August 24, 2001.

Value Line. 2001c. "Chemical (Specialty)." p. 482. September 21, 2001.

THIS PAGE INTENTIONALLY LEFT BLANK